STORMWATER TREATMENT AREA NO. 3 & 4

PLAN FORMULATION

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5. HYDROLOGIC DATA

5.1 INTRODUCTION

This section of the *Plan Formulation* document includes a compilation and summary of District-furnished hydrologic data for use in long-term simulations of the hydrologic performance of STA-3/4. This data includes rainfall, evapotranspiration and inflows to STA-3/4 from the North New River Canal (the S-7/S-2 basin) and the Miami Canal (the S-8/S-3 basin). Those operational simulations are discussed in Section 7 of this *Plan Formulation* document.

The results of those operational simulations will then be coupled with estimates of influent total phosphorus (TP) loads (including atmospheric deposition) over the 31-year simulation period and updated estimates of treatment performance and mean outflow TP concentrations prepared. Those updated treatment performance projections are presented in Section 9 of this *Plan Formulation* document.

This section includes an analysis to determine whether or not the District-furnished hydrologic annual inflow data differs significantly from the 1994 *Conceptual Design* data and 1999 *Alternatives Analysis* data. The analysis includes a comparison of the District-furnished data between total annual inflow and annual runoff data for the years 1979-88 and the data for years 1965-95 to determine whether or not the 1979-88 period was drier than normal, as well as a comparison of inflow volumes during peak events.

5.2 RAINFALL

The rainfall data, as furnished by the District, is taken directly from the South Florida Water Management Model (SFWMM) and the corresponding model grids that represent STA-3/4. This data was furnished on a daily time step for the 31-year period from 1965 through 1995. The data included daily values for each of the 7 model grids representing STA-3/4 in the SFWMM. These grids include (43,21), (43,22), (43,23), (43,24), (43,22),

(43,23) and (43,24). The daily average rainfall across these 7 grids has been computed and will be applied uniformly to all cells within STA-3/4 as the daily rainfall for the treatment area simulations. The monthly and annual data is summarized in Table 5.1.

Table 5.1

SFWMM Monthly Rainfall at STA-3/4

	Rainfall in inches												
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Annual**
1965	0.14	2.26	0.86	0.39	0.65	10.15	9.89	4.70	6.02	6.47	0.23	0.61	42.37
1966	3.67	1.96	0.88	1.48	3.39	16.38	4.34	7.39	7.01	10.06	0.33	0.41	57.30
1967	1.22	3.50	0.31	0.00	1.16	16.05	8.57	6.24	5.12	6.24	0.31	1.98	50.69
1968	1.29	3.09	0.83	3.17	9.50	12.17	8.64	3.71	4.80	5.33	1.97	0.08	54.56
1969	1.64	1.87	3.56	2.10	5.15	13.12	5.87	6.12	7.10	10.68	3.55	1.06	61.82
1970	2.67	2.52	9.31	0.17	10.91	11.74	6.51	2.26	5.22	3.72	0.09	0.22	55.35
1971	0.93	1.38	0.30	0.06	5.92	9.19	6.27	4.08	9.97	6.39	2.00	2.07	48.55
1972	1.44	1.95	6.27	3.50	9.87	8.02	5.99	9.45	1.45	0.74	1.76	1.45	51.90
1973	1.38	0.78	2.07	1.02	3.24	6.37	6.94	10.13	4.67	2.64	0.89	1.46	41.61
1974	2.16	0.92	0.94	2.31	2.98	10.74	7.66	6.06	4.91	0.73	1.23	1.81	42.44
1975	1.35	0.88	0.89	1.19	6.13	10.98	4.50	4.43	6.99	1.63	2.34	0.87	42.19
1976	0.21	2.15	1.21	1.54	11.93	6.37	5.20	7.60	7.55	0.10	1.89	2.21	47.96
1977	4.06	0.35	0.99	0.68	8.24	8.90	3.36	7.00	5.91	0.42	3.82	3.23	46.97
1978	2.88	2.14	2.09	0.84	2.89	5.10	12.16	6.16	5.33	3.95	2.15	2.77	48.46
1979	2.74	0.58	2.73	3.24	4.42	5.48	7.90	6.45	8.96	2.52	3.54	1.87	50.42
1980	4.39	1.29	3.83	2.62	4.93	2.67	4.46	4.57	5.71	2.11	2.82	0.73	40.14
1981	0.60	2.82	0.72	0.21	5.92	2.96	3.91	15.65	3.07	0.35	4.19	0.08	40.49
1982	0.21	0.55	1.32	0.96	11.20	12.99	5.01	4.97	10.79	3.12	0.70	0.62	52.45
1983	4.74	8.34	5.12	2.13	1.78	7.19	8.10	5.79	3.48	4.40	1.04	4.15	56.26
1984	0.35	1.04	5.08	2.41	7.41	4.14	3.48	4.16	2.50	0.16	1.96	0.43	33.12
1985	0.51	0.06	2.30	4.46	1.59	11.42	12.44	5.50	8.11	2.93	1.84	0.77	51.92
1986	2.37	0.99	6.96	0.39	7.25	12.02	3.22	5.66	2.16	3.19	1.70	4.69	50.60
1987	0.62	0.82	5.82	0.34	4.02	4.51	8.44	5.53	10.15	3.59	4.57	0.71	49.13
1988	2.04	1.57	1.22	2.42	3.51	5.49	8.86	8.34	1.99	0.64	1.14	0.07	37.29
1989	0.60	0.01	2.17	3.12	0.90	6.28	9.26	8.15	9.04	3.79	0.82	1.43	45.57
1990	0.22	3.14	2.31	2.06	3.80	8.99	7.69	9.88	1.22	3.19	0.47	1.17	44.15
1991	9.58	2.93	1.60	5.53	8.78	8.00	9.06	6.48	4.87	3.70	4.41	0.10	65.05
1992	0.68	4.87	1.29	4.09	2.11	18.39	1.38	12.40	5.76	1.18	6.19	0.59	58.94
1993	7.90	1.89	4.76	3.74	4.25	10.30	6.67	7.99	12.31	8.76	0.78	0.80	70.14
1994	5.04	3.08	5.80	4.05	3.22	6.05	5.22	6.95	11.33	5.61	6.97	12.66	75.98
1995	2.81	1.56	1.48	1.82	3.71	7.18	14.38	10.36	4.90	7.93	0.21	0.82	57.16
						1965-1995							
Maximum	9.58	8.34	9.31	5.53	11.93	18.39	14.38	15.65	12.31	10.68	6.97	12.66	75.98
Minimum	0.14	0.01	0.30	0.00	0.65	2.67	1.38	2.26	1.22	0.10	0.09	0.07	33.12
Average	2.27	1.98	2.74	2.00	5.19	9.01	6.95	6.91	6.08	3.75	2.13	1.68	50.68
						1979-1988							
Maximum	4.74	8.34	6.96	4.46	11.20	12.99	12.44	15.65	10.79	4.40	4.57	4.69	56.26
Minimum	0.21	0.06	0.72	0.21	1.59	2.67	3.22	4.16	1.99	0.16	0.70	0.07	33.12
Average	1.86	1.81	3.51	1.92	5.20	6.89	6.58	6.66	5.69	2.30	2.35	1.41	46.18

5.3 EVAPOTRANSPIRATION

Similar to the rainfall data, the evapotranspiration (ET) data furnished by the District is taken directly from the SFWMM and the corresponding model grids that represent STA-3/4. This ET is reference evapotranspiration for a turf grass cover. Actual simulated ET values in the SFWMM are computed based on a modified Penman-Monteith equation and are a function of the water depth and vegetation coefficients in each of the model grids. Additional detail on the computation of estimated actual ET from these reference values for differing vegetation/crop types and location of the water table relative to the ground surface may be found on the District's web site. The address of that site is: *sfwmd.gov/org/pld/hsm/models/sfwmm/v3.5*.

This data was furnished on a daily time step for the 31-year period from 1965 through 1995. The data included daily values for each of the 7 model grids representing STA-3/4 in the SFWMM. These grids include (43,21), (43,22), (43,23), (43,24), (43,22), (43,23) and (43,24). The average reference ET across these 7 grids has been computed and will be applied uniformly to all cells within STA-3/4 as the daily (reference) ET value for the treatment area simulations. The monthly and annual data is summarized in Table 5.2.

Table 5.2

SFWMM Monthly (Reference) ET at STA-3/4

	Reference ET in inches												
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Annual**
1965	3.62	3.97	5.39	6.24	6.66	5.67	5.33	5.15	4.59	4.52	3.74	3.42	58.30
1966	3.16	3.71	4.81	5.60	6.00	4.86	4.75	4.93	4.06	4.45	3.88	3.28	53.49
1967	3.46	3.90	5.17	6.20	6.84	5.10	5.44	4.99	4.32	4.34	3.65	3.32	56.74
1968	3.19	3.71	5.04	5.93	5.58	4.86	5.45	5.29	4.54	4.43	3.44	3.25	54.71
1969	3.34	3.68	4.34	5.46	5.89	5.44	5.30	5.12	4.08	4.50	3.66	3.35	54.17
1970	3.70	3.84	4.86	5.97	6.54	5.73	4.97	4.96	4.79	4.79	3.65	3.55	57.34
1971	3.62	4.22	5.81	6.54	7.05	5.46	5.68	5.05	4.30	4.22	3.79	3.79	59.52
1972	3.66	4.27	5.58	5.95	5.89	5.45	5.15	5.03	4.74	4.70	3.27	3.54	57.23
1973	3.28	3.48	5.08	5.93	6.21	5.41	4.81	4.58	4.39	4.77	3.68	3.29	54.92
1974	3.19	4.16	5.59	6.20	6.59	5.35	5.12	4.98	4.53	4.76	3.61	3.19	57.28
1975	3.70	4.13	5.52	6.25	6.09	5.42	5.05	5.28	4.64	4.63	3.73	3.61	58.06
1976	3.53	4.05	5.46	5.93	5.77	4.98	5.56	5.07	4.29	4.88	3.42	3.25	56.17
1977	3.34	3.82	5.39	6.20	6.22	5.84	5.46	4.82	4.49	4.77	3.62	3.31	57.27
1978	3.30	3.44	4.92	5.97	6.24	5.58	5.04	5.19	4.51	4.39	3.73	3.65	55.95
1979	3.51	3.86	5.28	5.81	6.04	6.44	5.45	4.85	4.44	4.61	3.74	3.10	57.13
1980	3.51	3.97	5.29	5.53	6.55	6.19	5.48	5.15	4.76	4.89	3.65	3.32	58.30
1981	3.42	4.16	5.37	6.10	7.11	6.05	6.01	4.75	4.50	4.91	3.88	3.55	59.81
1982	3.87	4.23	5.40	5.76	6.18	5.71	5.94	5.42	4.65	4.62	3.55	3.58	58.91
1983	3.15	3.61	5.07	6.01	6.85	5.64	5.65	5.34	4.68	4.43	3.68	3.52	57.64
1984	3.52	3.96	5.33	5.76	6.28	5.84	5.04	5.54	4.83	5.25	3.80	3.63	58.77
1985	3.64	4.12	5.49	5.77	6.90	5.87	5.16	5.10	4.67	4.94	4.06	3.28	59.00
1986	3.53	4.17	5.12	6.40	6.40	5.35	5.57	5.32	5.11	5.05	3.86	3.39	59.26
1987	3.49	3.55	4.74	6.15	6.70	6.01	5.99	5.78	4.63	4.72	3.67	3.38	58.81
1988	3.28	3.94	5.06	6.39	6.23	5.36	5.27	5.14	5.12	5.26	4.00	3.47	58.54
1989	3.74	4.18	5.17	5.71	6.75	5.89	5.56	5.08	4.96	4.74	3.63	2.98	58.39
1990	3.71	4.30	5.14	5.78	6.15	5.66	5.44	4.78	4.63	4.72	3.86	3.59	57.76
1991	3.53	4.01	5.27	5.45	6.22	5.29	5.22	5.40	4.42	4.04	3.26	3.08	55.19
1992	2.97	3.45	4.78	5.22	6.67	4.83	6.61	5.13	4.49	4.78	3.72	3.68	56.34
1993	3.32	3.74	4.61	6.08	6.49	6.39	6.50	6.45	5.30	4.42	3.58	3.36	60.25
1994	3.17	3.29	4.57	5.79	6.19	5.10	5.65	5.24	4.40	4.26	3.25	2.88	53.79
1995	3.01	3.00	4.87	5.54	5.92	5.07	5.31	5.00	4.30	4.46	3.63	2.85	52.97
						1965-1995							
Maximum	3.87	4.30	5.81	6.54	7.11	6.44	6.61	6.45	5.30	5.26	4.06	3.79	60.25
Minimum	2.97	3.00	4.34	5.22	5.58	4.83	4.75	4.58	4.06	4.04	3.25	2.85	52.97
Average	3.43	3.87	5.15	5.92	6.36	5.54	5.45	5.16	4.59	4.65	3.67	3.37	57.16
						1979-1988							
Maximum	3.87	4.23	5.49	6.40	7.11	6.44	6.01	5.78	5.12	5.26	4.06	3.63	59.81
Minimum	3.15	3.55	4.74	5.53	6.04	5.35	5.04	4.75	4.44	4.43	3.55	3.10	57.13
Average	3.49	3.96	5.22	5.97	6.52	5.85	5.56	5.24	4.74	4.87	3.79	3.42	58.62

5.4 ANNUAL INFLOW VOLUMES TO STA-3/4

The inflow data furnished by the District is directly from the SFWMM simulation for Alternative 1 of the STA-3/4 Outflow works performed with the SFWMM V3.6 in May 1999. That simulation was conducted by the District in support of the *Alternatives Analysis* for STA-3/4. The assumptions and results of the simulations were documented in the following SFWMD internal report:

> Cadavid, Luis G., *Analysis of the Effects of the Outflow Works for STA 3/4 - Everglades Construction Project*, Internal memorandum sent to Joe Schweigart, Gary Goforth and Randy Bushey dated July 21, 1999. Hydrologic Systems Modeling Division, South Florida Water Management District, West Palm Beach, Florida.

This data was furnished on a daily time step for the 31-year period from 1965 through 1995. These inflows have been identified and separated by basin (i.e., North New River and Miami) and by source. The sources include basin runoff, regulatory releases, BMP make-up water, 298 District runoff, S-236 runoff, G-136 contribution and water supply for STA-3/4. The basic assumptions made in the generation of inflow volumes for that simulation are consistent with those recommended in the *Alternatives Analysis* for estimating long-term average inflows to STA-3/4.

For the treatment area simulations, the water supply component (i.e., supplemental inflows intended to maintain minimum stages in the treatment area interior) of the inflow to STA-3/4 has been removed from the inflow data set. The operational simulations described in Section 7 include development of estimated supplemental water supply requirements for different operational strategies. The water supply deliveries reflected in the District's simulation occurred only in January 1965 and probably served to establish water levels in STA-3/4 at the beginning of the simulation.

Over the 31-year simulation period, the estimated average annual inflow to STA-3/4 from both the North New River Canal and the Miami Canal is 645,222 acre-feet. Over the 10-year period 1979-88, the estimated average annual inflow to STA-3/4 from both the North New River Canal and the Miami Canal is 638,136 acre-feet. In comparison, the average annual inflow volumes recommended in the *Conceptual Design* and in the *Alternatives Analysis* for sizing STA-3/4 were 604,800 acre-feet and 641,000 acre-feet, respectively.

5.4.1 North New River Basin

Components of inflow from the North New River basin include basin runoff and Lake Okeechobee regulatory releases. For this analysis, it has been assumed that any BMP make-up water for the NNR basin will be directed along the Miami Canal because of the lower concentration of total phosphorus in discharges from Lake Okeechobee at Structure S-354 and the Miami Canal as compared to that at Structure S-351 and the North New River. The total annual inflow volume from the North New River over the 31-year period of simulation is summarized in Table 5.3.

Over the 31-year simulation period, the estimated average annual inflow to STA-3/4 from the North New River Canal is 254,928 acre-feet. Over the 10-year period 1979-1988 (calendar years), the estimated average annual inflow to STA-3/4 from the North New River Canal is 252,601 acre-feet. In comparison, the average annual inflow volumes recommended in the *Conceptual Design* and in the *Alternatives Analysis* for sizing STA-3/4 were 287,500 acre-feet and 288,200 acre-feet, respectively.

5.4.2 Miami Canal Basin

Components of inflow from the Miami Canal basin include basin runoff, Lake Okeechobee regulatory releases, all BMP make-up water, South Shore Drainage District runoff, S-236 (South Florida Conservancy District Planning Unit No. 5) runoff and C-139 Basin runoff delivered to the Miami Canal through G-136 and the L-1E Canal. The

supplemental water supply for STA-3/4 has been removed from this inflow data set. The total annual inflow volume from the Miami Canal over the 31-year period of simulation is summarized in Table 5.4.

Over the 31-year simulation period, the estimated average annual inflow to STA-3/4 from the Miami Canal is 390,294 acre-feet. Over the 10-year period 1979-88, the estimated average annual inflow to STA-3/4 from the Miami Canal is 385,535 acre-feet. In comparison, the average annual inflow volumes recommended in the *Conceptual Design* and *Alternatives Analysis* for sizing STA-3/4 were 317,400 acre-feet 352,800 acre-feet, respectively.

Table 5.3

Annual Inflow Volume for the North New River

Year	Inflow Volume (acre-feet) Runoff	Regulatory Releases	Total Inflow
1965	222,402	1,804	224,206
1966	304,893	30,877	335,770
1967	184,529	96,183	280,713
1968	284,373	24,225	308,597
1969	307,351	167,916	475,268
1970	233,539	243,168	476,707
1971	223,834	-	223,834
1972	183,055	-	183,055
1973	178,730	-	178,730
1974	199,740	8,364	208,104
1975	230,720	-	230,720
1976	182,036	-	182,036
1977	191,344	-	191,344
1978	249,464	-	249,464
1979	237,217	121,376	358,593
1980	172,755	214,954	387,709
1981	124,350	-	124,350
1982	238,584	4,971	243,556
1983	230,644	149,437	380,082
1984	147,870	183,393	331,263
1985	189,474	-	189,474
1986	221,671	-	221,671
1987	124,398	48,790	173,188
1988	116,120	-	116,120
1989	120,653	-	120,653
1990	110,335	-	110,335
1991	207,312	19,086	226,398
1992	228,090	9,650	237,739
1993	199,967	101,692	301,659
1994	325,609	867	326,477
1995	229,972	74,994	304,965
1965-1995			
Maximum	325,609	243,168	476,707
Minimum	110,335	-	110,335
Average	206,485	48,443	254,928
1979-1988			
Maximum	238,584	214,954	387,709
Minimum	116,120	-	116,120
Average	180,308	72,292	252,601

Table 5.4

Annual Inflow Volume for the Miami Canal

Year	Inflow Volume (acre-feet)							
	Runoff	Regulatory Releases	BMP Miami	BMP NNR	298 Dist. Runoff	S-236 Runoff	G-136 Contrib	Total Inflow
1965	261,685	7,147	61,349	49,123	4,300	12,263	13,273	409,139
1966	242,002	70,728	72,114	57,268	3,346	16,474	12,124	474,057
1967	218,773	122,219	61,632	45,418	2,032	9,196	13,761	473,029
1968	298,058	-	76,491	56,464	4,615	13,883	13,684	463,196
1969	261,612	207,500	67,745	52,739	5,116	18,274	15,033	628,020
1970	237,519	319,679	86,875	69,429	4,130	9,309	13,611	740,552
1971	246,991	-	56,117	44,878	4,715	11,795	10,846	375,343
1972	130,029	-	45,165	35,695	2,833	19,815	10,344	243,880
1973	122,077	-	51,979	40,507	3,070	16,928	9,943	244,504
1974	192,645	6,644	61,620	49,481	2,730	11,364	14,666	339,149
1975	246,875	-	67,505	47,720	4,454	13,163	16,265	395,982
1976	107,433	-	57,872	46,023	3,438	18,649	10,689	244,103
1977	190,457	-	49,379	36,267	2,915	13,851	13,460	306,328
1978	238,942	-	75,986	59,849	6,572	14,965	12,541	408,855
1979	186,919	154,730	78,555	55,728	3,272	16,282	10,429	505,916
1980	105,759	269,297	71,926	55,818	2,563	14,292	6,293	525,948
1981	67,141	-	35,164	22,116	823	12,686	5,798	143,727
1982	165,839	-	73,910	52,446	1,975	17,864	13,585	325,619
1983	221,498	176,581	86,130	66,367	4,477	12,602	11,873	579,528
1984	127,905	186,252	76,152	59,308	3,285	9,542	10,062	472,507
1985	150,117	-	68,718	53,373	3,505	12,492	12,768	300,974
1986	203,554	-	70,512	54,378	2,704	12,687	12,413	356,249
1987	161,935	59,474	66,216	46,584	2,526	7,505	10,483	354,723
1988	137,143	-	74,661	60,763	2,718	7,971	6,902	290,159
1989	93,523	-	46,604	36,985	2,457	10,382	8,618	198,569
1990	50,556	-	41,522	32,457	2,112	14,543	7,667	148,857
1991	231,418	-	94,476	76,720	4,508	14,718	754	422,594
1992	204,065	12,858	117,688	90,720	4,368	14,818	5,045	449,561
1993	160,860	116,718	75,520	50,381	4,471	11,460	13,563	432,973
1994	330,112	8,115	20,219	15,724	4,692	17,801	19,440	416,103
1995	265,269	79,978	32,138	26,444	4,089	8,969	12,069	428,958
1965-1995								
Maximum	330,112	319,679	117,688	90,720	6,572	19,815	19,440	740,552
Minimum	50,556	-	20,219	15,724	823	7,505	754	143,727
Average	188,991	57,997	65,224	49,909	3,510	13,437	11,226	390,294
1979-1988								
Maximum	221,498	269,297	86,130	66,367	4,477	17,864	13,585	579,528
Minimum	67,141	-	35,164	22,116	823	7,505	5,798	143,727
Average	152,781	84,633	70,195	52,688	2,785	12,392	10,061	385,535

5.4.3 Inflow Pumping Operations

The daily inflow data is further summarized by basin to represent the potential inflow pumping data for G-370 and G-372. A flow/duration curve has been generated as a plot of mean daily inflow as a function of the percent time exceeded for both the 31-year period (1965-95) and the 10-year period (1979-88). This data for the North New River is summarized in Table 5.5 and Figure 5.1. The data for the Miami Canal is presented in Table 5.6 and Figure 5.2.

Table 5.5

North New River – Flow/Duration Data

Flow (cfs)	1965-1995 # Days Exceeded	1965-1995 % Time Exceeded	1979-1988 # Days Exceeded	1979-1988 % Time Exceeded
0	11322	100%	3653	100%
10	4952	44%	1517	42%
100	3891	34%	1207	33%
200	3541	31%	1106	30%
300	3300	29%	1039	28%
400	3104	27%	996	27%
500	2964	26%	965	26%
600	2806	25%	920	25%
700	2675	24%	878	24%
800	2393	21%	759	21%
900	2260	20%	717	20%
1000	2052	18%	666	18%
1100	1758	16%	587	16%
1200	1339	12%	472	13%
1300	1080	10%	353	10%
1400	947	8%	294	8%
1500	862	8%	258	7%
1600	814	7%	247	7%
1700	768	7%	235	6%
1800	736	7%	227	6%
1900	0	0%	0	0%

Figure 5.1

NNR Flow/Duration Curve

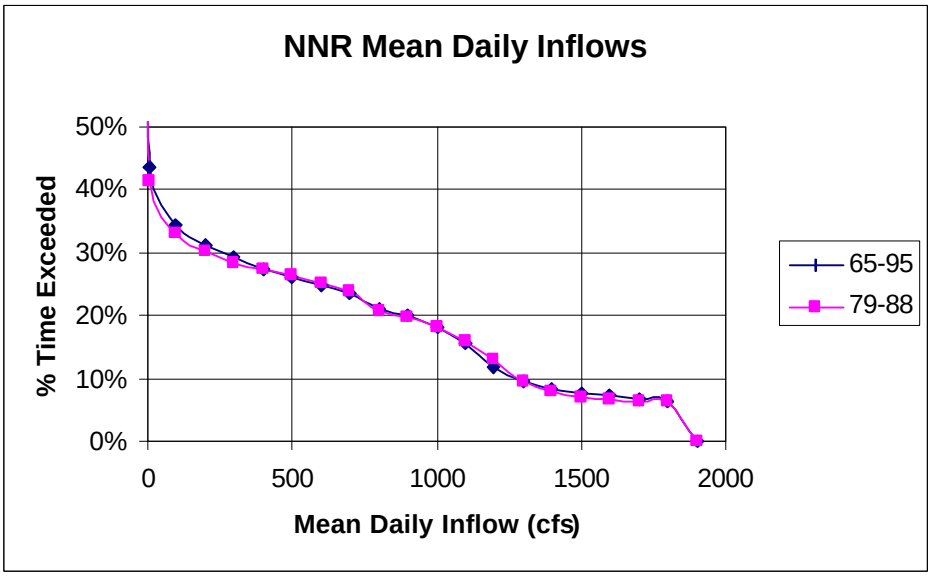


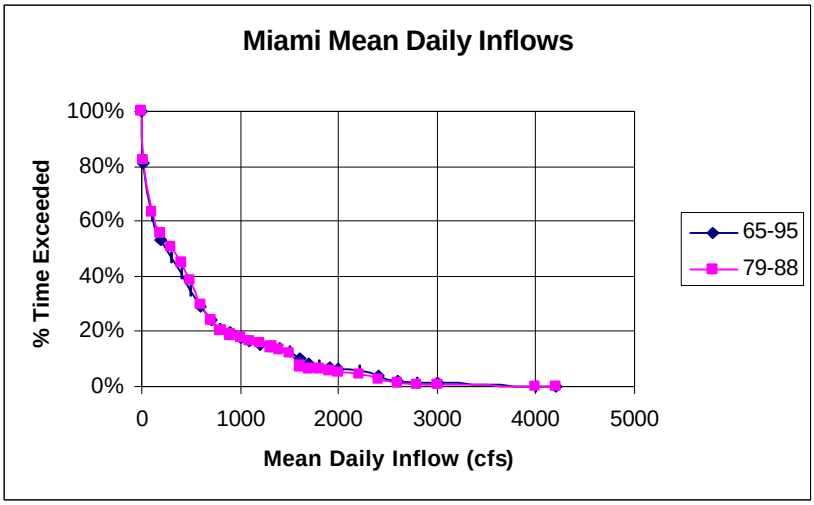
Table 5.6

Miami Canal – Flow/Duration Data

Flow (cfs)	1965-1995 # Days Exceeded	1965-1995 % Time Exceeded	1979-1988 # Days Exceeded	1979-1988 % Time Exceeded
0	11322	100%	3653	100%
10	9158	81%	3012	82%
100	7044	62%	2320	64%
200	6039	53%	2029	56%
300	5305	47%	1844	50%
400	4672	41%	1641	45%
500	3920	35%	1420	39%
600	3286	29%	1094	30%
700	2698	24%	877	24%
800	2391	21%	747	20%
900	2206	19%	701	19%
1000	2028	18%	656	18%
1100	1856	16%	602	16%
1200	1749	15%	568	16%
1300	1662	15%	533	15%
1400	1546	14%	485	13%
1500	1414	12%	433	12%
1600	1123	10%	281	8%
1700	939	8%	238	7%
1800	876	8%	220	6%
1900	817	7%	203	6%
2000	739	7%	184	5%
2200	615	5%	152	4%
2400	447	4%	102	3%
2600	245	2%	55	2%
2800	163	1%	31	1%
3000	140	1%	29	1%
4000	2	0%	0	0%
4200	0	0%	0	0%

Figure 5.2

Miami Canal Flow/Duration Curve



5.4.4 Inflow Durations

From the daily inflow data for each basin, the maximum inflow volumes by year for durations of 1 day, 7 days, 14 days, 30 days and 60 days has been determined. This data is summarized in Table 5.7 for the North New River and Table 5.8 for the Miami Canal.

Table 5.7

North New River - Maximum Inflow Volumes

Year	Maximum Inflow Volume (cfs-days) 1-day	7-day	14-day	30-day	60-day
1965	1,860	12,571	18,982	29,492	49,706
1966	1,860	13,020	22,361	36,680	67,987
1967	1,860	13,020	21,162	37,350	61,007
1968	1,860	12,448	24,684	42,981	72,791
1969	1,860	12,120	20,756	39,230	64,873
1970	1,860	13,020	21,902	41,021	78,530
1971	1,860	12,208	19,880	32,547	50,684
1972	1,860	11,557	14,181	25,950	49,158
1973	1,860	10,500	18,925	31,588	51,482
1974	1,860	12,326	22,957	42,906	64,648
1975	1,860	12,080	22,504	33,438	50,593
1976	1,860	12,196	17,250	28,788	49,341
1977	1,860	13,020	20,782	29,795	43,520
1978	1,860	11,926	18,865	37,503	63,751
1979	1,860	13,020	20,733	37,554	56,915
1980	1,860	10,819	19,302	39,420	76,863
1981	1,860	13,020	23,985	37,728	48,907
1982	1,860	13,020	21,721	33,023	56,076
1983	1,860	12,342	20,470	42,927	80,759
1984	1,860	12,314	19,783	33,623	55,915
1985	1,860	11,732	17,123	29,568	42,096
1986	1,860	11,486	15,205	27,747	41,411
1987	1,860	11,481	15,392	24,598	33,830
1988	1,860	12,264	18,024	29,197	48,777
1989	1,860	9,705	14,419	26,527	41,326
1990	1,860	7,839	12,904	21,363	35,952
1991	1,860	11,437	14,467	26,743	46,412
1992	1,860	13,020	18,355	35,497	58,862
1993	1,860	12,082	21,471	39,403	58,715
1994	1,860	13,020	16,683	31,519	50,426
1995	1,860	12,708	17,251	31,222	54,042
			1965-1995		
Maximum	1,860	13,020	24,684	42,981	80,759
Minimum	1,860	7,839	12,904	21,363	33,830
Average	1,860	12,043	19,112	33,449	55,011
			1979-1988		
Maximum	1,860	13,020	23,985	42,927	80,759
Minimum	1,860	10,819	15,205	24,598	33,830
Average	1,860	12,150	19,174	33,538	54,155

Table 5.8

Miami Canal - Maximum Inflow Volumes

Year	Maximum Inflow Volume (cfs-days) 1-day	7-day	14-day	30-day	60-day
1965	4,113	19,278	31,070	53,645	78,750
1966	3,640	18,361	29,163	44,827	83,771
1967	3,640	16,642	25,307	49,102	88,003
1968	3,640	20,474	34,111	54,003	90,993
1969	3,395	19,113	30,615	53,105	92,385
1970	3,640	22,180	33,555	67,428	118,212
1971	3,640	19,340	31,602	46,302	74,569
1972	3,642	18,804	24,528	30,325	54,973
1973	3,634	13,336	20,198	30,805	46,559
1974	3,640	18,081	29,910	53,166	87,947
1975	3,657	18,424	28,648	47,641	75,116
1976	2,868	13,416	17,528	32,987	46,373
1977	3,908	21,362	25,422	32,732	53,682
1978	3,653	15,803	21,843	42,608	71,721
1979	3,612	16,251	26,125	39,657	68,341
1980	3,640	15,798	26,677	52,148	98,220
1981	2,281	11,645	18,417	28,790	35,131
1982	3,640	20,734	26,966	49,658	59,657
1983	3,640	18,589	26,110	50,787	96,118
1984	3,640	18,836	24,098	41,499	70,596
1985	3,114	10,844	19,336	27,621	45,492
1986	3,640	20,838	30,347	44,012	59,546
1987	3,640	18,384	25,310	37,081	62,761
1988	3,630	14,436	23,308	38,611	55,169
1989	2,552	8,331	13,325	23,495	41,862
1990	2,867	8,193	10,007	18,318	29,442
1991	3,640	19,270	20,659	37,817	66,406
1992	3,640	22,424	23,836	35,097	64,056
1993	3,640	14,197	22,843	46,382	68,411
1994	3,640	16,553	26,275	39,464	63,216
1995	3,640	22,165	27,772	43,033	72,601
			1965-1995		
Maximum	4,113	22,424	34,111	67,428	118,212
Minimum	2,281	8,193	10,007	18,318	29,442
Average	3,510	17,165	24,997	41,682	68,390
			1979-1988		
Maximum	3,640	20,838	30,347	52,148	98,220
Minimum	2,281	10,844	18,417	27,621	35,131
Average	3,448	16,636	24,669	40,987	65,103

5.5 COMPARISON OF SIMULATION PERIODS

The February 1994 *Conceptual Design* for the Everglades Construction Project was developed on the basis of hydrologic data for a base period encompassing water years 1979-88. Numerous reviewers have suggested that period was a relatively "dry" period not truly reflective of long-term basin hydrology.

The total annual inflow and annual runoff data for North New River and for Miami Canal for the original design data years, 1979-88, were compared with the years 1965-95 to determine whether or not the period 1979-88 was drier than normal.

For the North New River Canal, the 1979-88 and 1965-95 simulated average total annual inflows were 252,601 acre-feet and 254,928 acre-feet, respectively. The frequency distributions of the total annual inflows for the two time periods (Figure 5.3) show there is no clear difference in their distributions. However, the frequency distribution for the annual runoffs (e.g., EAA basin discharges excluding Lake releases and interbasin transfers) show that the 1979-88 period (Figure 5.4) is more skewed towards the low annual runoff years than the 1965-95 period.

For the Miami Canal, the 1979-88 and 1965-95 simulated average total annual inflows were 385,535 acre-feet and 390,294 acre-feet, respectively. The frequency distributions of the total annual inflows for the two time periods (Figure 5.5) also show no clear difference in their distributions. The frequency distribution clearly shows that the annual runoffs (e.g., EAA basin discharges excluding Lake releases and interbasin transfers) that the 1979-88 period (Figure 5.6) has a higher percentage of low annual runoff years than the 1965-95 period.

Although the total simulated inflow for each canal is but slightly lower for the 1979-88 period, the runoffs for each canal clearly show that this period was drier than normal. The regulatory releases and BMP makeup water releases for those years made up for the lack of runoff; hence, the total simulated inflows for 1979-88 were not significantly different from the 1965-95 time period.

Figure 5.3

Frequency of Total Annual Inflow of Years 1979-88 vs. 1965-95 of North New River

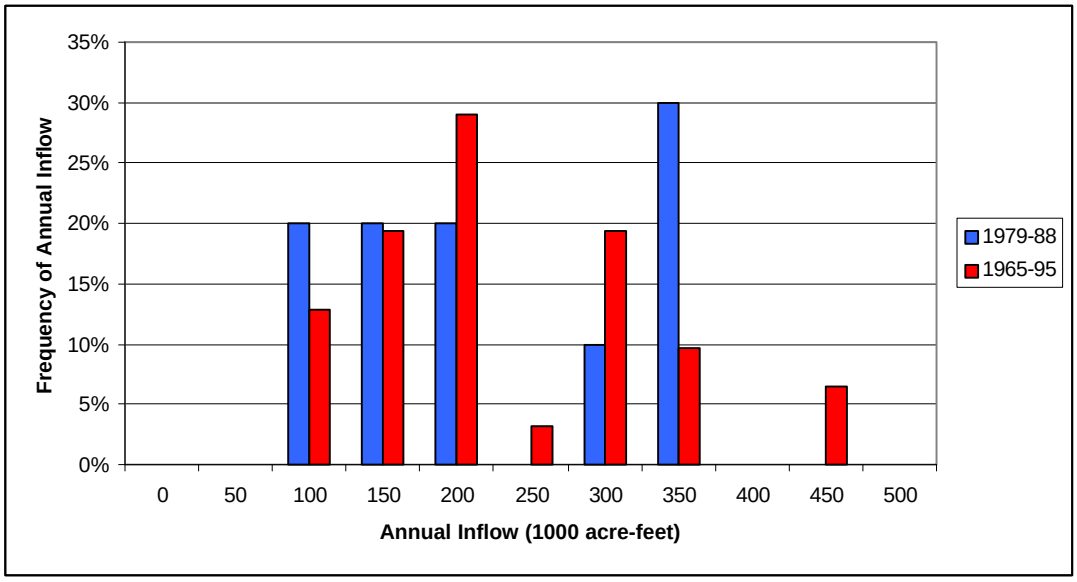


Figure 5.4

Frequency of Annual Runoff of Years 1979-88 vs. 1965-95 of North New River

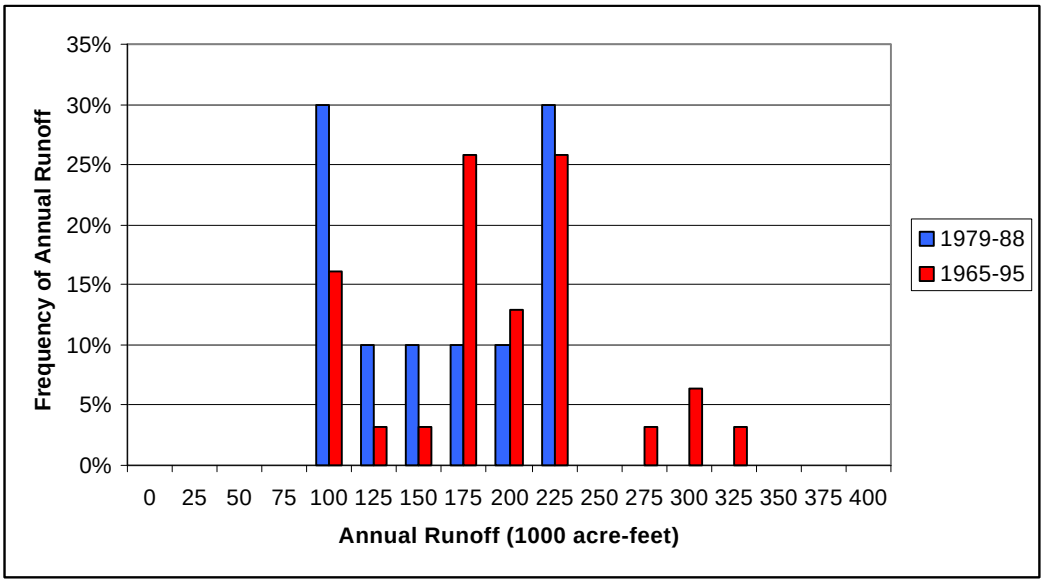


Figure 5.5

Frequency of Total Annual Inflow of Years 1979-88 vs. 1965-95 of Miami Canal

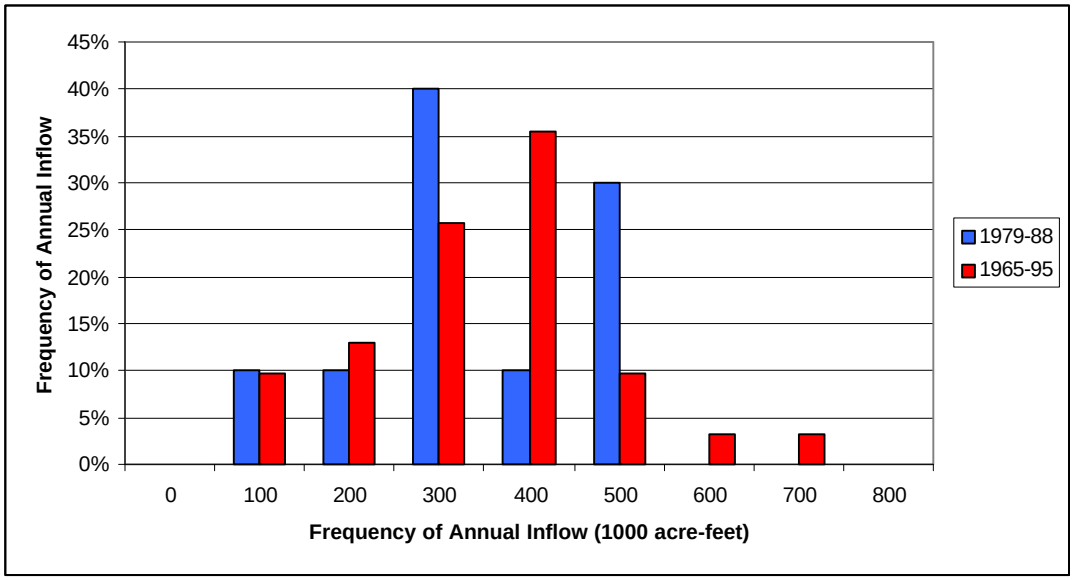
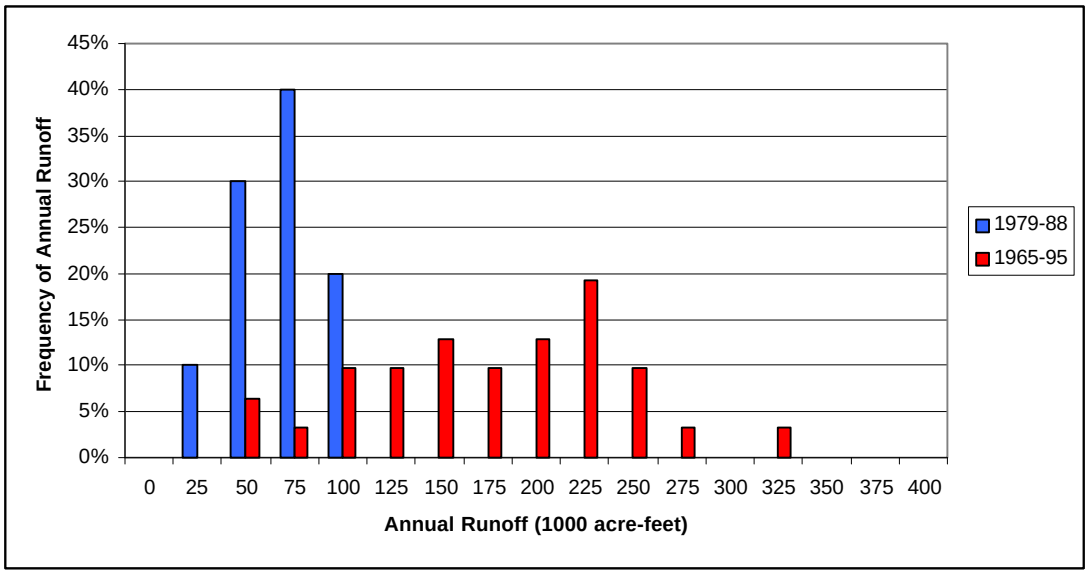


Figure 5.6

Frequency of Annual Runoff of Years 1979-88 vs. 1965-95 of Miami Canal



5.5.1 Comparison of Peak Inflow Durations

A basic criteria imposed upon the design and operation of the Everglades Construction Project, including STA-3/4, is that there should be no need for bypass of the treatment facilities given a repetition of the underlying hydrology of the 1979-88 base period. It can therefore be assumed that bypass (although undesirable with respect to overall treatment objectives) could be allowed under more extreme hydrologic conditions. That potential for bypass under extreme events is of significance in that, should significantly greater inflow events have occurred in 1965-78 and 1989-99 than during the base period, design of the system to prevent bypass could result in a requirement for increased stages and, as result, increased levee heights.

Inspection of the data summarized in Table 5.7 reveals that, for the North New River Canal, little difference exists in the inflow volumes during peak events for the two simulation periods. As a result, it is unlikely that any difference would exist in required levee heights for the two periods.

Inspection of the data summarized in Table 5.8 reveals that, for the Miami Canal, measurable differences do exist the inflow volumes during peak events for the two simulation periods. The influence of these differences on peak stages (and required levee heights) is further explored in the long-term operational simulations discussed in Section 7 of this *Plan Formulation* document.